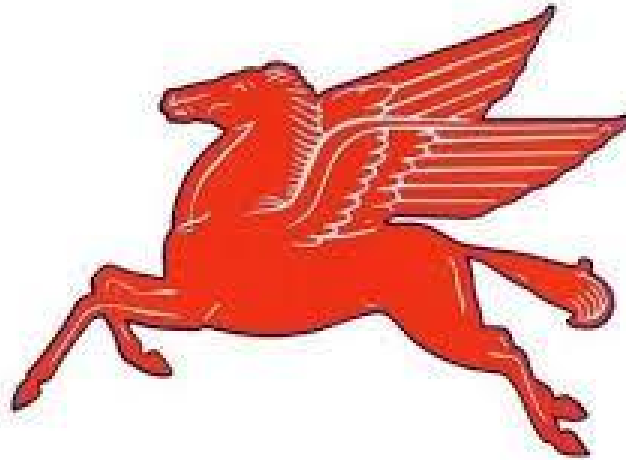


Curriculum Management System

PAULSBORO PUBLIC SCHOOLS



BIOLOGY I

UPDATED 2022

For adoption by all regular education programs as specified and for adoption or adaptation by all Special Education Programs in accordance with Board of Education Policy.

Board Approved: 2022

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Ms. Stacey DiMeo, Director of Special Services

Mrs. Tina Morris, Principal, grades Pre-K to 2

Mr. Matthew J. Browne, Principal, grades 3-6

Mr. Paul Morina, Principal, grades 7-12

Paulsboro Public Schools

Mission Statement

The mission of the Paulsboro School District is to work with students, parents, educators, and community to develop excellence in education while preparing each student to be viable and productive citizens in society. Our goal is to develop the unique potential of the whole student by creating a challenging and diverse learning climate that prepares students for the 21st Century and is rich in tradition and pride.

PACING CHART

TOPIC	# OF DAYS	DATES	COMMENTS
From Molecules to Organisms: Structures and Processes	45	9/7/2022 – 11/9/2022	<i>Students formulate an answer to the question "How do the structures of organisms enable life's functions?" Students investigate explanations for the structure and functions of cells as the basic unit of life, of hierarchical organization of interacting organ systems, and of the role of specialized cells for maintenance and growth</i>
Ecosystems: Interactions, Energy and Dynamics	45	11/14/2022 – 1/27/2023	<i>Students construct explanations for the role of energy in the cycling of matter in organisms and ecosystems.</i>
Heredity: Inheritance and Variation of Traits	45	1/30/2023 – 4/3/2023	<i>Students analyze data develop models to make sense of the relationship between DNA and chromosomes in the process of cellular division, which passes traits from one generation to the next</i>
Biological evolution: Unity and Diversity	45	4/4/2023 – 6/9/2023	<i>Students construct explanations for the processes of natural selection and evolution and then communicate how multiple lines of evidence support these explanations.</i>

Unit 1

Big Idea: From Molecules to Organisms: Structures and Processes

NJSLS - Science:

HS-LS1-1: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

HS-LS1-4: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms

HS-LS1-5: Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

HS-LS1-6: Construct and revise an explanation based on evidence for how carbon, hydrogen and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

HS-LS1-7: Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are

Critical Knowledge and Skills

Concept(s): Students formulate an answer to the question "*How do the structures of organisms enable life's functions?*" Students investigate explanations for the structure and functions of cells as the basic unit of life, of hierarchical organization of interacting organ systems, and of the role of specialized cells for maintenance and growth. The crosscutting concepts of *structure and function*, *matter and energy*, and *systems and system models* are called out as organizing concepts for the disciplinary core ideas. Students use *critical reading*, *modeling*, and *conducting investigations*. Students also use the science and engineering practices to demonstrate understanding of the disciplinary core ideas. Students analyze data develop models to make sense of the relationship between DNA and chromosomes in the process of cellular division, which passes traits from one generation to the next. Students determine why individuals of the same species vary in how they look, function, and behave. Students develop *conceptual models* of the role of DNA in the unity of life on Earth and *use statistical models* to explain the importance of variation within populations for the survival and evolution of species. Ethical issues related to genetic modification of organisms and the nature of science are described.

Students are able to:

Students will be able to explain the connection between the sequence and the subcomponents of a biomolecule and its properties

Students will be able to ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

Students will be able to construct models that explain the movement of molecules across membranes with membrane structure and function.

Learning Goal(s):

Illustrate how all cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins.

Identify how each chromosome consists of a single, very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA.

Explain that the instructions for forming species' characteristics are carried in the DNA.

broken and the bonds in new compounds are formed resulting in a net transfer of energy.

Related Interdisciplinary Standards:

WHST.9-12.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

WHST.9-12.5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

WHST.9-12.7: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

WHST.9-12.9: Draw evidence from informational texts to support analysis, reflection, and research.

HSF-BF.A.1: Write a function that describes a relationship between two quantities.

MODIFICATIONS:

Advanced Learner:

Students will be able to develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Students will be able to provide examples and explain how organisms use feedback systems to maintain their internal environments.

Students will be able to plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis

Students will be able to use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms
Students will be able to diagram the carbon cycle in an ecosystem.

Students will be able to identify and describe organelles found in eukaryotes (emphasis on chloroplast and mitochondria)

Students will be able to determine how a leaf designed to absorb sunlight, CO₂, and water, while releasing ATP and O₂

Students will be able to compare and contrast light dependent and independent reactions.

Explain that systems of specialized cells within organisms help them perform the essential functions of life. Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.

Describe how all cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.

Compare and contrast negative feedback mechanisms and positive feedback mechanisms. Feedback (negative or positive) can stabilize or destabilize a system

Illustrate how in multicellular organisms, individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow

Investigate that the organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells.

Describe how cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together

Requirement for more analysis, more details in experiments, projects, open ended questions, and Students create questions for further investigation and study

Students with Disabilities:

Provide simplified information, worksheets, etc. Use of gestures, TPR, pictures and realia. Provide hands on experience, Students will use cooperative learning, peer tutoring, extended time, reteach in utilizing various methods. Utilize remediation resources which include assessment and intervention, in planning and instruction.

English Language Learners:

Utilize ESL and foreign language teachers. Permit the usage of native language/English dictionary, Google translate, and websites in native language. Provide word banks where appropriate. When necessary, provide simplified information, worksheets, etc. Use of gestures, TPR, pictures and realia. Provide hands on experience, in the classroom, via experiments.

Students will be able to describe the stages of aerobic cellular respiration.

Students will be able to contrast aerobic and anaerobic respiration.

to meet the needs of the whole organism.

Describe the Carbon cycle

Recognize and describe organelles involved in photosynthesis & respiration

Understand leaf structure and function

Identify the reactions in photosynthesis

Describe the stages of cellular respiration

Compare and contrast aerobic and anaerobic respiration

Describe how do different organisms obtain and use energy to survive in their environment

Explain how energy and matter is cycled through an ecosystem

Formative/Summative Assessments

Formative: participation in team activities, research, verbal communication,

Primary & Supplementary Resources

Text: Biology: Stephan Nowicki

observations, experiments,
www.edulastic.com, independent problems
during lessons, lesson quizzes

Benchmark/Summative: Topic assessments,
formal lab sheets, experiments, essays,
research simulation tasks

www.teacherpayteacher.com

www.biologycorner.com

www.youtube.com

www.Sciencedirect.com

www.khanacademy.org

www.nature.com

[www.national geographic.com](http://www.nationalgeographic.com)

www.visiblebody.com

Various question/answer worksheets

Informational text worksheets

UNIT 2

Big Idea: Ecosystems: Interactions, Energy and Dynamics

NJSLS - Science:

Critical Knowledge and Skills

HS-LS2-1: Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

HS-LS2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

HS-LS2-3: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions

HS-LS2-4: Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem

HS-LS2-5: Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

HS-LS2-6: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem

HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Related Interdisciplinary Standards:

Concept(s): In this unit of study, students formulate answers to the question “how and why do organisms interact with each other (biotic factors) and their environment (abiotic factors), and what affects these interactions?” Secondary ideas include the interdependent relationships in ecosystems; dynamics of ecosystems; and functioning, resilience, and social interactions, including group behavior. Students also develop an understanding of how human activities affect natural resources and of the interdependence between humans and Earth's systems, which affect the availability of natural resources. Students use mathematical reasoning and models to make sense of carrying capacity, factors affecting biodiversity and populations, the cycling of matter and flow of energy through systems. Students use *computational representations* to analyze how earth systems and their relationships are being modified by human activity

Students are able to:

Students will observe and analyze how organisms respond to stimuli and attempt to maintain homeostasis.

Students will contrast the size and complexity differences among the levels of organization.

Compare and contrast food chains with food webs. They will be able to explain why food chains are not a realistic representation of a community of organisms.

Students will analyze changes in quantities of matter and energy that exist in an ecological energy pyramid.

Students will differentiate the interactions of predation, competition, and symbiosis.

Contrast changes in populations when positive increases happen due to immigration and birth with decreases caused by emigration and mortality.

Learning Goal(s):

Identify the characteristics of life

Describe the levels of organization in ecology (biosphere → organism)

Analyze food chains & food webs

Describe an energy pyramid and the 10% rule

Compare and contrast species interactions: predation, competition, symbiosis

Use the scientific method to investigate how changes in populations: immigration, emigration, mortality, natality, affect the ecosystem

Interpret growth curves/carrying capacity

Apply the scientific process to investigate anthropogenic changes (induced by human activity) in the environment,

RST.9-10.8: Determine if the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

WHST.9-12.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

WHST.9-12.5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

WHST.9-12.7: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

HSN -Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

HSN -Q.A.2: Define appropriate quantities for the purpose of descriptive modeling.

Students will compare and contrast population changes in logistic and exponential growth

Students use computational representations to analyze how earth systems and their relationships are being modified by human activity.

Students will be able to design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Students will be able to create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

Students will be able to explore human dependence on Earth's resources and the nature and effects of human interactions with their environment.

Students will be able to understand that the sustainability of human societies and the biodiversity that supports them require responsible management of natural resources.

Students will be able to synthesize information from multiple sources and evaluate claims about the impacts of human activity on biodiversity based on analysis of evidence.

including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change, can disrupt an ecosystem and threaten the survival of some species.

Evaluate the severity of the issue of climate change through discussion, experimentation, and observation in order to further students understanding of the topic and the impact their own activities have on their surroundings.

Examine Biodiversity and its importance to life

Develop an understanding of how human activities affect natural resources and of the interdependence between humans and Earth's systems, which affect the availability of natural resources.

Use the scientific process to evaluate how humans can mitigate adverse impacts of human activity on biodiversity

Analyze how the sustainability of human societies and the biodiversity that supports them require responsible management of natural resources.

Explain how biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction).

HSN -Q.A.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

HSS- ID.A.1: Represent data with plots on the real number line.

MODIFICATIONS:

Advanced Learner:

Requirement for more analysis, more details in experiments, projects, open ended questions, and Students create questions for further investigation and study

Students with Disabilities:

Provide simplified information, worksheets, etc. Use of gestures, TPR, pictures and realia. Provide hands on experience, Students will use cooperative learning, peer tutoring, extended time, reteach in utilizing various methods. Utilize remediation resources which include assessment and intervention, in planning and instruction.

English Language Learners:

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Students will be able to understand that sustaining biodiversity is critical to maintaining functional ecosystems.

Students can also investigate and research major contributions of scientists and engineers who have developed technologies to produce less pollution and waste in order to prevent ecosystem degradation.

Students will be able to design and evaluate a solution for a proposed problem related to threatened or endangered species or to genetic variation of organisms for multiple species.

Describe how humans depend on the living world for the resources and other benefits provided by biodiversity but human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change.

Analyze how changes in the physical environment, whether naturally occurring or human induced, have contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species.

Formative/Summative Assessments

Formative: participation in team activities, research, verbal communication, observations, experiments, www.edulastic.com, independent problems during lessons, lesson quizzes

Primary & Supplementary Resources

Text: Biology: Stephan Nowicki
www.teacherpayteacher.com
www.biologycorner.com
www.youtube.com
www.Sciencedirect.com

and realia. Provide hands on experience, in the classroom, via experiments.

Benchmark/Summative: Topic assessments, formal lab sheets, experiments, essays, research simulation tasks

www.khanacademy.org

www.nature.com

www.nationalgeographic.com

www.visiblebody.com

www.panda.org

www.summitlearning.org

quizlet.com

www.worldwildlife.org

climate.nasa.gov

www.un.org

www.epa.gov

Various question/answer worksheets

Informational text worksheets

UNIT 3

Big Idea: Heredity: Inheritance and Variation of Traits

NJSLS - Science:

HS-LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

HS-LS3-2: Make and defend a claim based on evidence that inheritable genetic variations may

Critical Knowledge and Skills

Concept(s): Students analyze data develop models to make sense of the relationship between DNA and chromosomes in the process of cellular division, which passes traits from one generation to the next. Students determine why individuals of the same species vary in how they look, function, and behave. Students develop *conceptual models* of the role of DNA in the unity of life on Earth and *use statistical models* to explain the importance of variation within populations for the survival and evolution of species. Ethical issues related to genetic modification of organisms and the nature of science are described. Students explain the mechanisms of genetic inheritance and describe the

result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

HS-LS3 -3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

Related Interdisciplinary Standards:

WHST.9-12.1 Write arguments focused on discipline-specific content.

MP.2 Reason abstractly and quantitatively.

MODIFICATIONS:

Advanced Learner:

Requirement for more analysis, more details in experiments, projects, open ended questions, and Students create questions for further investigation and study

Students with Disabilities:

Provide simplified information, worksheets, etc. Use of gestures, TPR, pictures and realia. Provide hands on experience, Students will use cooperative learning, peer tutoring, extended time, reteach in utilizing various methods. Utilize remediation resources which include assessment and intervention, in planning and instruction.

environmental and genetic causes of gene mutation and the alteration of gene expressions. The crosscutting concepts of *structure and function*, *patterns*, and *cause and effect* are used as organizing concepts for the disciplinary core ideas. Students also use the science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Students are able to:

Students will be able to ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

Students will be able to make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

Students will be able to apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population

Students will be able to ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

Learning Goal(s):

Illustrate how all cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins.

Identify how each chromosome consists of a single, very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA.

Explain that the instructions for forming species' characteristics are carried in the DNA.

Describe how all cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways.

Clarify that not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have, as yet, no known function.

Express that although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in

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Students will be able to create representations that explain how genetic information flows from a sequence of nucleotides in a gene to a sequence of amino acids in a protein

Students will be able to construct an explanation based on evidence for how the structure of DNA determines the structure of proteins that carry out the essential functions of life through systems of specialized cells.

mutations, which are also a source of genetic variation.

Explain how environmental factors can cause mutations in genes, and viable mutations are inherited. Environmental factors also affect expression of traits, and hence affect the probability of occurrence of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors.

Describe how in sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation.

Formative/Summative Assessments

Formative: participation in team activities, research, verbal communication, observations, experiments, www.edulastic.com, independent problems during lessons, lesson quizzes

Primary & Supplementary Resources

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www.biologycorner.com
www.youtube.com